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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF
THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to rubber rollers for conveyance, such as a photoprint using the non oil rubber composition which uses EPM (ethylene propylene rubber) as the main ingredients especially the non oil rubber composition of the type which does not contain an oil component as a softener, and this.

[0002]

[Description of the Prior Art]In recent years, demand grows with the spread of color pictures, it prints easily and promptly, and many Print Club (common name of registered trademark "instant photo machine to make tiny stickers") preparation devices which a user can gain, automatic certification photograph preparation devices, etc. are installed.

[0003]As a material used for the rubber roller which conveys, the cut sheet-like photographic paper, i.e., the photoprint, after a development, in these Print Club preparation devices, automatic certification photograph preparation devices, etc., Frictional force with a photoprint is large and it is important that it is low hardness and that there is little wear to conveyance (delivery) of a repeated photoprint.

[0004]As a rubber composition for manufacturing such a rubber roller, the rubber composition which uses an ethylene-propylene-diene ternary polymerization object (EPDM) as the main ingredients was used conventionally.

[0005]

[Problem(s) to be Solved by the Invention]However, in order to obtain the rubber roller of low hardness conventionally, a lot of oil is blended as a softener, When the rubber roller which consists of a rubber composition which uses such oil content EPDM as the main ingredients was made into the rubber roller for conveyance (delivery) of a photoprint, the oil which deposited on the surface of the rubber roller (bleeding) adhered

on the surface of the photoprint, and there was a problem that the surface of a print became dirty.

[0006]In order to obtain the rubber roller of low hardness, when the oil as a softener was blended with the rubber composition which uses EPDM as the main ingredients, there was a problem of reducing abrasion resistance remarkably. On the other hand, it was dramatically difficult to obtain the rubber roller not more than durometer hardness A55, when oil is not blended with EPDM.

[0007]On the other hand, although addition combination of a vulcanizing agent or the rubber accelerator is conventionally carried out as a hardening agent for stiffening rubber by vulcanization operation to the rubber composition, there is a problem of causing the phenomenon (bloom) in which these vulcanizing agents and rubber accelerators deposit on the rubber surface. If generated by bloom, in order that the frictional force of a rubber roller and a photoprint might decline extremely, the rubber roller was slippery and there were a problem that a photoprint cannot be conveyed, and a problem of polluting the surface of a photoprint.

[0008]In order that this invention person may solve the above-mentioned problem, as a result of repeating examination wholeheartedly, it is a rubber composition which uses EPM (ethylene propylene rubber) as the main ingredients, By considering it as the so-called rubber composition of non oil, without completely using softeners, such as oil, It is low hardness, has the conveyance (delivery) characteristics, such as an outstanding photoprint, finds out that rubber rollers for conveyance, such as a photoprint which moreover does not have the contamination to mating materials, such as a photoprint, can be formed, and came to complete this invention.

[0009]It is a rubber composition which the purpose of this invention solves the problem of the above-mentioned conventional technology, and uses EPM as the main ingredients, and is what is called a non oil type, without completely using softeners, such as oil, Are low hardness, for this reason, do not soil the surfaces, such as a print, and completely between photoprints, It is in providing rubber rollers for conveyance, such as a photoprint using the non oil rubber composition and this which use EPM as the main ingredients which can acquire higher frictional force and can maintain the conveyance characteristics, such as a stable photoprint, for a long period of time.

[0010]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, an invention of a non oil rubber composition which uses the EPM of this invention according to claim 1 as the main ingredients, EPM100 weight section of Mooney viscosity $ML_{1+4}(100^{**})$ 35 - 75, three to bulking agent 20 weight section, 2.5 to organic peroxide 4 weight section as a cross linking agent, and 0.1 to bridge construction auxiliary agent 5 weight section are blended, and it is characterized by things.

[0011]This invention is characterized by rubber rollers for conveyance, such as a photoprint, comprising the following.

An elastic body layer which fabricates the above-mentioned non oil rubber composition to tubed.

An axis with which a medial axis of this was equipped.

[0012]

[Embodiment of the Invention]Below, an embodiment of the invention is described.

[0013]the non oil rubber composition which uses EPM by this invention as the main ingredients -- Mooney viscosity $ML_{1+4}(100^{**})$ 35-75 -- EPM of 38-50 is contained preferably.

[0014]Since a compression set and abrasion resistance will get worse here if Mooney viscosity $ML_{1+4}(100^{**})$ of EPM is less than 35, it is not desirable. Since hardness will rise and the conveyance (delivery) characteristics, such as a photoprint, will fall if Mooney viscosity $ML_{1+4}(100^{**})$ of EPM exceeds 75, it is not desirable.

[0015]At least one substance selected from the groups which consist of silica, titanium oxide, calcium carbonate, carbon black, clay, and talc is used for the above-mentioned bulking agent. Here, the loadings of a bulking agent are five to 15 weight section preferably three to 20 weight section to EPM100 weight section. Since the mechanical strength of the rubber roller obtained by shaping is not enough if the loadings of a bulking agent are less than three weight sections to EPM100 weight section, it is not desirable. Since hardness will rise and the conveyance (delivery) characteristics, such as a photoprint, will fall if the loadings of a bulking agent exceed 20 weight sections to EPM100 weight section, it is not desirable.

[0016]The organic peroxide as the above-mentioned cross linking agent JIKUMIRU peroxide, 1,3-bis(t-butyl par OKISHIISO propyl)benzene, 2,5-dimethyl- 2,5-di-(tert-butyl peroxide) hexane, Ethyl-3,3-bis(tert-butyl peroxide)butyrate, t-butyl cumyl peroxide, 1,1-bis(tert-butyl peroxide)-3,3,5-trimethylcyclohexane, n-butyl-4,4-bis(tert-butyl peroxide)valerate, and (t-butyl par OKISHIISO propyl) at least one compound selected from the groups which consist of carbonate are used. It is preferred to use the JIKUMIRU peroxide and 1,3-bis(t-butyl par OKISHIISO propyl)benzene in which a low compression set is obtained especially, and 2,5-dimethyl- 2,5-di-(tert-butyl peroxide) hexane. The organic peroxide as the above-mentioned cross linking agent is independent, or these may use it for two sorts, mixing them.

[0017]The loadings of the organic peroxide as a cross linking agent are 2.8 to 3.4 weight section preferably 2.5 to 4 weight section to EPM100 weight section. Since the bridge construction in the case of the condensation polymerization of EPM is insufficient and the mechanical strength of the rubber roller obtained by shaping, a compression set, and abrasion resistance are not enough here if the loadings of the organic peroxide as a cross linking agent are less than 2.5 weight sections to EPM100 weight section, it is not desirable. If the loadings of organic peroxide exceed four weight sections to EPM100 weight section, the quantity of a superfluous cross linking agent or its decomposition product increases with the hardness rise of EPM, and it is not desirable.

[0018]In this invention, with such organic peroxide, sulfur, N, and N'-m-phenylenedimaleimide, 0.1-5 weight-section combination of the bridge construction auxiliary agents, such as triallyl isocyanurate, acrylic acid zinc, methacrylic acid zinc, a polyfunctional methacrylate monomer, styrene butadiene rubber, butadiene rubber and syndiotactic one 1, and 2-polybutadiene rubber, is carried out. Abrasion resistance and a compression set property can be raised by blending such a bridge construction auxiliary agent.

[0019]Since shaping of rubber will become difficult and also it will become what was inferior in rubber physical properties, such as abrasion resistance and a compression set, here if the loadings of a bridge construction auxiliary agent are less than 0.1 weight sections, it is not desirable. Since low hardness-ization of a rubber roll will become

difficult and also problems, such as a fall of the maximum elongation and increase of a compression set, will occur if the loadings of a bridge construction auxiliary agent exceed five weight sections, it is not desirable.

[0020]It is preferred to use sulfur, in order to obtain the cross linked rubber excellent in the balance on physical properties, such as low hardness, a compression set, and elongation, as a bridge construction auxiliary agent of the above-mentioned non oil rubber composition. Sulphuric desirable loadings are 0.4 to 0.6 weight section more preferably 0.1 to 1.0 weight section to EPM100 weight section. Here, in less than 0.1 weight sections, bridge construction cannot fully do the loadings of sulfur as a bridge construction auxiliary agent to EPM100 weight section, but abrasion resistance worsens. If the loadings of sulfur as a bridge construction auxiliary agent exceed one weight section to EPM100 weight section, sulfur as a bridge construction auxiliary agent will act as a retarder (vulcanization inhibition agent), and a vulcanization speed fall and a crosslinking density fall will be brought about. Since the conveyance characteristics, such as a photoprint, fall in order that the unreacted sulfur which was not used for bridge construction may carry out bloom to the rubber surface and may reduce a coefficient of friction on it, it is not desirable.

[0021]In the above-mentioned non oil rubber composition, it can contain five or less weight sections to EPM100 weight section further, other rubbers (EPDM), for example, ethylene propylene diene terpolymer rubber etc., etc.

[0022]Since a compression set will become large and the conveyance (delivery) characteristics, such as a photoprint, will fall if the loadings of the above and other rubbers exceed five weight sections to EPM100 weight section, it is not desirable.

[0023]In addition, the combination drug generally [, such as processing aid and an antiaging agent,] used for combination of rubber can be blended if needed.

[0024]This invention is characterized by rubber rollers for conveyance, such as a photoprint, comprising the following.

The elastic body layer which fabricates the above-mentioned non oil rubber composition to tubed.

The axis which the medial axis of this is equipped and is usually metal.

[0025]As for the durometer hardness of the elastic body layer of a rubber roller, it is preferred that it is in the range of A45-A52. Here, if the hardness of the elastic body layer of a rubber roller is less than [A45], abrasion resistance is not enough, and since hardness rises, a coefficient of friction falls and the conveyance characteristics, such as a photoprint, will fall if the hardness of the elastic body layer of a rubber roller exceeds A52, it is not desirable.

[0026]Knead the non oil rubber composition which uses the above EPM by this invention as the main ingredients, and this is vulcanized with a conventional method, Rubber rollers for conveyance, such as a photoprint, can be manufactured by fabricating to the roller geometry of a heavy-gage cartridge, obtaining an elastic body layer, and equipping the medial axis of this elastic body layer with the axis made from stainless steel, for example.

[0027]

[Example]Next, although the example of this invention is described with a comparative example, this invention is not limited to these examples.

[0028]EPM of example 1 Mooney-viscosity $ML_{1+4}(100^{**})$ 40 The product made from [JSR, Inc., trade names, and EP11: It is EPM (1) and written] all over a table. To 100 weight sections, it is JIKUMIRU peroxide. [organic-peroxide cross linking agent: It is cross linking agent (1) and written] all over a table. (Made by Nippon Oil & Fats Co., Ltd.) the silica (the Japan silica industrial incorporated company make.) as 3.2 weight sections and a bulking agent Trade name nip seal ER5 weight section, titanium oxide (TiO_2) (made by right anabolism study incorporated company) 5 weight section, and sulfur (Tsurumi chemical industry incorporated company) 0.5 weight section as a bridge construction auxiliary agent were blended, and the non oil rubber composition was manufactured using the kneading machine.

[0029]And after extruding the above-mentioned non oil rubber composition, vulcanization molding is carried out on condition of for 170 ** and 10 minutes using the metallic mold corresponding to the shape of a rubber roller, A rubber elasticity body whorl the outer diameter of 11 mm, 2 mm in inside diameter, and 17 mm in length was built, further, metal axes were inserted in the boss of this elastic body layer, and the rubber roller was manufactured.

[0030]Although carried out like example 2 Example 1, EPDM(product [made from JSR, Inc.], trade name, and EP33)5 weight section which has Mooney viscosity $ML_{1+4}(100^{**})$ 43, the iodine value 15, and 43% of propylene content further was blended with the rubber composition of Example 1, and the non oil rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from this non oil rubber composition.

[0031]Although carried out like Example 3 and four Examples 1, to EPM(1) 100 weight section, it replaced with sulfur, SBR(product [made from JSR, Inc.], trade name, and SBR1502) 3 weight section and five weight sections were blended as a bridge construction auxiliary agent, respectively, and the non oil rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from these non oil rubber compositions.

[0032]Although carried out like example 5 Example 1, it is 1,3-bis(t-butyl par OKISHIISO propyl)benzene to EPM(1) 100 weight section. [organic-peroxide cross linking agent: All over a table, it is cross linking agent (2) and written]. (Made by Kayaku AKZO Corp.) 3.2 weight sections, silica 5 weight section as a bulking agent, titanium oxide (TiO_2) 10 weight section, and sulfur 0.5 weight section as a bridge construction auxiliary agent were blended, and the non oil rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from these non oil rubber compositions.

[0033]Although carried out like example 6 Example 1, it is EPM of Mooney viscosity $ML_{1+4}(100^{**})$ 74. The product made from [JSR, Inc., trade names, and T7971: It is EPM (2) and written] all over a table. To 100 weight sections, it is JIKUMIRU peroxide. [Cross linking agent (1)] 3.2 weight sections, silica 5 weight section as a bulking agent, titanium oxide (TiO_2) 10 weight section, and sulfur 0.5 weight section as a bridge construction auxiliary agent were blended, and the non oil rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from these non oil rubber compositions.

[0034]Although carried out like comparative example 1 Example 1, EPDM(Japan Synthetic Rubber Co., Ltd. make, trade name, and EP33)10 weight section was blended to

EPM(1) 90 weight section, and the rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from this rubber composition.

[0035]Although carried out like comparative example 2 Example 1, to EPM(1) 100 weight section, it replaced with sulfur, the SBR10 above-mentioned weight section was blended as a bridge construction auxiliary agent, and the rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from these rubber compositions.

[0036]Although carried out like comparative example 3 Example 1, it replaces with EPM, and it is JIKUMIRU peroxide to EPDM(Japan Synthetic Rubber Co., Ltd. make, trade name, andEP33)100 weight section. [Cross linking agent (1)] 2.8 weight sections, silica 5 weight section as a bulking agent, and titanium oxide (TiO₂) 5 weight section were blended, and the rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from this rubber composition.

[0037]Paraffin series oil (Idemitsu Kosan, Inc. make, trade name, andPW380) 5 weight section was blended with the rubber composition of the comparative example 4 comparative example 3, and the rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from these rubber compositions.

[0038]Although carried out like comparative example 5 Example 1, paraffin series oil (Idemitsu Kosan, Inc. make, trade name, andPW380) 5 weight section was blended with the rubber composition of Example 1, and the rubber composition was manufactured using the kneading machine. The rubber roller was manufactured like the case of Example 1 from these rubber compositions.

[0039>About the rubber roller produced in the evaluation test above-mentioned examples 1-6 and the comparative examples 1-5, in order to evaluate various characteristics, such as elasticity as a rubber roller, a mechanical strength, and abrasion resistance, (1) It examined by measuring durometer hardness, (2) (%) and rebound resilience, (3) (%) and compression sets, (4) tension elasticity (MPa), (5) maximum (%) and elongation, and (6) tear strength (kN/m) based on JIS, respectively.

[0040]The rubber roller of the above-mentioned Examples 1-6 and the comparative examples 1-5 was attached to the system of the color printer apparatus for photoprints, and the resistance to contamination of a photoprint and the conveyance characteristic of the photoprint were evaluated to it.

[0041]Here, the evaluation tests of the resistance to contamination of a photoprint and the conveyance characteristic of a photoprint were done as follows.

[0042]It was observed by viewing whether the remains of a roller have occurred in the printing image of a photoprint which made the system of the color printer apparatus which attached the rubber roller of the above-mentioned Examples 1-6 and the comparative examples 1-5 pass a photoprint, and was passed to it, and how it was.

[0043]And what has "O" and the remains of a roller in some which do not have the remains of a roller in the printing image of the photoprint which passed the rubber roller was made into "x", and it indicated in front.

[0044]At this time, the operation of the rubber roller estimated as follows the carrying force of the photoprint which has inside of a color printer apparatus conveyed.

[0045]photoprint conveyance characteristic O: -- O: in which carrying force is very high -
- **: with high carrying force -- conveyance -- instability x: -- the result in which misfeed
may have been generated was summarized in the following table 1, and was shown.

[0046]

[Table 1]

| 配合剤 (重量部) | 実施例 1 | 実施例 2 | 実施例 3 | 実施例 4 | 実施例 5 | 実施例 6 | 比較例 1 | 比較例 2 | 比較例 3 | 比較例 4 | 比較例 5 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| EPM (1) | 100 | 100 | 100 | 100 | 100 | — | 90 | 100 | — | — | 100 |
| EPM (2) | — | — | — | — | — | 100 | — | — | — | — | — |
| EPDM | — | 5 | — | — | — | — | 10 | — | 100 | 100 | — |
| シリカ | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| TiO ₂ | 5 | 5 | 5 | 5 | 10 | 10 | 5 | 5 | 5 | 5 | 5 |
| 架橋剤 (1) | 3.2 | 3.2 | 3.2 | 3.2 | — | 3.2 | 3.2 | 3.2 | 2.8 | 2.8 | 3.2 |
| 架橋剤 (2) | — | — | — | — | 3.2 | — | — | — | — | — | — |
| 架橋助剤：硫黄 | 0.5 | 0.5 | — | — | 0.5 | 0.5 | 0.5 | — | — | — | 0.5 |
| 架橋助剤：SBR | — | — | 3 | 5 | — | — | — | 10 | — | — | — |
| オイル | — | — | — | — | — | — | — | — | — | 5 | 5 |
| 評価 | | | | | | | | | | | |
| デュロメータ硬さ | A45 | A46 | A48 | A50 | A48 | A51 | A50 | A50 | A53 | A51 | A43 |
| 反発弾性 (%) | 63 | 63 | 62 | 61 | 67 | 74 | 61 | 62 | 70 | 69 | 61 |
| 圧縮永久歪み (%) | 8.4 | 8.7 | 8.9 | 9.5 | 5.9 | 5.6 | 11.0 | 17.0 | 5.0 | 7.0 | 9.5 |
| 引張り弾性 (MPa) | 1.3 | 1.2 | 1.4 | 1.5 | 1.8 | 1.2 | 1.7 | 2.5 | 1.3 | 1.3 | 1.3 |
| 最大伸び (%) | 267 | 250 | 275 | 250 | 288 | 250 | 312 | 342 | 130 | 150 | 275 |
| 引裂き強度 (kN/m) | 11.6 | 11.0 | 12.0 | 14.0 | 12.2 | 12.3 | 13.0 | 19.0 | 15.0 | 14.0 | 13.0 |
| 写真プリント耐汚染性 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × |
| 写真プリント搬送特性 | ◎ | ◎ | ○ | ○ | ○ | ○ | △ | △ | × | ○ | ○ |

From the result of Table 1, like [it is ***** and] in the rubber roller of Examples 1-6 of this invention. There is no oil bleeding like before and contamination of the photoprint was prevented, and since it was what is called a non oil type, in carrying processes, such as a photoprint, the surfaces, such as a print, are not soiled and it excelled in resistance to

contamination. Although the conveyance characteristic of the photoprint was excellent in each, it was excellent in the rubber roller of Examples 1-6 in the rubber roller of Examples 1 and 2 especially. In the rubber roller of Examples 1-6, it had the rubber elasticity body whorl excellent in various characteristics, such as elasticity as a rubber roller, a mechanical strength, and abrasion resistance. At the rubber roller of Examples 1-6, in the stage of a non oil rubber composition, it excels dramatically in physical properties and processability, and workability, and it was checked in it that the fault of conventional technology is canceled.

[0047]On the other hand, by the comparative examples 1 and 2, although it has resistance to contamination about the rubber roller of the comparative examples 1-3, respectively, since there are many loadings of EPDM to EPM or SBR, a compression set is large and the conveyance characteristic of a photoprint is inferior. According to the comparative example 3, since it replaces with EPM and EPDM is used, by non oil combination, it cannot low-hardness-ize but the conveyance characteristic of a photoprint is dramatically inferior. In the comparative example 4, since oil is added in order to lower hardness to the rubber composition of the comparative example 3 which replaced with EPM and uses EPDM further, the resistance to contamination of a photoprint is dramatically inferior. In the comparative example 5, since oil is further added to the rubber composition of Example 1, the resistance to contamination of a photoprint is dramatically inferior to it.

[0048]Although the rubber roller for photoprint conveyance created using the non oil rubber composition of this invention was explained in the above-mentioned example, This invention is applicable also as rubber rollers for conveyance, such as not only photoprints, such as a Print Club and a certification photograph, but various cards created with materials, such as a synthetic paper and plastics, in addition to this, a sheet, a seal, etc.

[0049]

[Effect of the Invention]The non oil rubber composition which uses EPM by this invention as the main ingredients, As mentioned above, it is what blends EPM100 weight section of Mooney viscosity $ML_{1+4}(100^{**})$ 35 - 75, three to bulking agent 20 weight section, 2.5 to organic peroxide 4 weight section as a cross linking agent, and 0.1 to bridge construction auxiliary agent 5 weight section, According to the non oil rubber composition of this invention, the non oil rubber composition fully provided with the various characteristics required of the rubber material used for rubber rollers for conveyance, such as a photoprint, can be obtained.

[0050]And the rubber roller fabricated using such a non oil rubber composition, While the conveyance characteristics, such as a photoprint which are low hardness, could obtain the high coefficient of friction between photoprints etc., and was stabilized, are maintainable for a long period of time, Since it is what is called a non oil type, in carrying processes, such as a photoprint, the surfaces, such as a print, are not soiled and the effect of excelling in resistance to contamination is done so.

[Translation done.]